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Title:

Impairments in complex language and coverbal gestures in Idiopathic Parkinson Disease

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Impairments in complex language and coverbal gestures in Idiopathic Parkinson Disease

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ABSTRACT

People produce meaningful bodily and facial movements when speaking. Gesture, facial affect, and speech prosody are linked and integral aspects of complex language production. They illuminate the production process at several levels of discourse analysis; e.g., they: reveal speaker thoughts and discourse plan when speech content is uninformative or ambiguous, illuminate semantic continuity between utterances, help to establish and maintain discourse themes, and punctuate points of contrastive discourse focus. Further, as persisting embodied representations, gestures support working memory, aiding the construction of coherent discourse. Given their communicative and cognitive significance, it is important to study these behaviors in individuals with Idiopathic Parkinson Disease, a neuromotor disorder that affects control of a range of bodily movements, and has known effects on articulation, voice, prosody, and manifestation of affect. We document impaired discourse structure and paucity of discourse content in 18 individuals with moderately severe IPD, who were videotaped telling a story. Deficiencies in complex language use correlate with lower rates of gesture production and low-specificity of gesture forms, compared to normals; also, with confusions seemingly brought on by aberrant timing relationships between hesitantly-produced gestures and co-expressive speech.

SUMMARY

Coverbal production of meaningful gesture is a universal feature of complex language use (Ekman & Friesen 1969; Kendon 1972, 1980, 2000; McNeill 1985, 1992), one on which neurogenic language disorders appear have an impact (Duncan 2002). Gesture, facial affect, and speech prosody are linked and integral aspects of language production (Bolinger 1983; Schegloff 1984; Nobe 1996; McNeill & Duncan 2000). These illuminate the production process at several levels of discourse analysis; e.g., by: revealing speaker thoughts and discourse plan when speech content is uninformative or ambiguous, illuminating semantic continuity between utterances, helping to establish and maintain discourse themes, and punctuating points of contrastive discourse focus (Duncan & Loehr). As persisting embodied representations, gestures support working memory, aiding the construction of coherent discourse (Iverson & Goldin-Meadow 1998; Goldin-Meadow et al. 2001). Given their communicative and cognitive significance, it is important to study these behaviors in individuals with Idiopathic Parkinson Disease, a neuromotor disorder that affects a range of bodily movements (Hoehn & Yahr 1967; Brandabur 2001). IPD has known effects on articulation, voice, prosody, and expression of affect (Ramig 1998; Spielman 2000). The disease also has disabling effects on aspects of complex language use (Lewis et al. 1998), similar to what is observed in frontal lobe and right hemisphere damage syndrome language disorders (McDonald 1993). The present research uses discourse analysis informed by observation of coverbal gesture, to add to our knowledge about language deficits in IPD; also, the roles in language production of subcortical brain structures (Murdoch 2001), motoric representations, and working memory (cf., Gabrieli, et al. 1996; Stebbins et al. 1999).

METHODS

Participants. Eighteen IPD patients, ages 45 to 76, were judged by their neurologists to be stably medicated and at stage two or three on the six-stage Hoehn and Yahr (1967) scale of IPD severity. A comparison sample of non-impaired participants, ages 40 to 68, was drawn from a corpus of narrative data elicited using the same procedure.

Procedure. We elicited connected narrative discourse using a 6.5-minute, animated cartoon stimulus. Each participant watched the cartoon and was then videotaped telling the story from memory to a naïve listener.

Analysis. Speech was transcribed in detail, including all pauses, self-interruptions, and dysfluencies. Professional-grade, hi-8 VCRs were used, permitting precise assessments of gesture-speech synchrony and close observation of gesture forms. Transcripts were annotated for co-occurrence of gestures with intervals of speech (see Duncan et al. 1995). The gesture data from each narration were analyzed independently by two experienced observers.

The total number of words and of gestures in each narration were tallied. Gesture form, execution, and meaning in relation to the co-occurring speech was noted, together with any referential value it shared with other gestures, or with spoken utterances in the preceding or following discourse. Finally, each speaker's recall of the cartoon's eight episodes and scenes within episodes were charted, noting instances of omission, re-ordering, fragmentation, conflation, digression, and confabulation.

RESULTS

The IPD participants' narrations varied in length from about 4.5 to 9 minutes. Speech quality was typical of individuals with IPD (Ramig 1998). Deficits included reduced loudness, breathy voice with 'fry,' flattened prosody, intervals of dysarthria and dysfluency, including hesitant speech and stutter. Some speakers showed intervals of speeded speech.

Quality of complex language use varied greatly across the sample of IPD speakers. However, all of their narrations were reduced, compared to those of the non-impaired speakers, in some or all of the following ways: shorter both in number of words and in cartoon episodes and scenes recalled, lower ratios of gestures to words, fewer distinct or differentiated gesture forms and less descriptive detail in speech, less perseverative use of marked gesture forms and locations in gesture space as indexes or carriers of discourse entities. In addition, many narrations were less coherent, due to omissions, fragmentation, and conflation of unrelated scenes; digressions, and confabulations. Finally, there sometimes occurred excessively long, hesitant gesture preparatory phases associated with speech disruptions, as—apparently—gesture images emerged so far in advance of co-expressive speech as to confuse the speaker or overload the production process. This anomaly of gesture-speech synchrony is largely unattested in non-impaired speakers.

DISCUSSION

In this descriptive study, we document impaired discourse structure and paucity of discourse content in individuals with moderately severe IPD in a complex language task. Narrative deficiencies correlate with lower rates of gesture production, simplified gesture forms, and low incidence of perseverative use of gesture forms and locations in gesture space to index overarching discourse themes; also, with confusions linked to aberrant timing relationships between gestures and co-expressive constituents of spoken discourse, interpreted as evidence of anomalous discourse planning strategies.

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